2025 Station Report for NCERA101
Conviron & Argus Controls

The last Conviron station report was 2017. The major update since then came in September 2022 when Conviron and Argus changed ownership, having been acquired by Madison Industries. Madison is a privately held Chicago based company with 320 facilities in 42 countries and 20,000 employees. Investment and technical support by a major US corporation will help Conviron and Argus position both companies to better meet the demands of our clients in the USA and around the world.

1. **New Facilities and Equipment**

- In 2024 Argus Controls completed the move of its manufacturing facility to Winnipeg, Canada. The Argus business office including sales, software and hardware design also moved its office from Surrey to nearby Langley, BC. Both Argus control systems and Conviron plant growth chambers are being manufactured in the same facility now in Winnipeg.
- Conviron secured an additional ambient control space in-house. A dedicated 110 sq. ft. walk in room to facilitate R&D and testing.

2. **Unique Plant Responses**

- Conviron has installed over 20,000 controlled environments for plant scientists around the world. Scientists that use our plant growth chambers study genetics and breeding, yield optimization, growth conditions, disease and pest resistance, climate change and other topics of importance to the farmers, the broader agriculture community and policymakers in the USA and around the world. In an effort to capture just some of the unique plant responses and noteworthy scientific findings, Conviron maintains an updated listing of recent research published in peer reviewed journals. Links to the journals can be found here: https://www.conviron.com/about/clients/academic/

3. **Accomplishments**

Every year Conviron seeks to document significant accomplishments that are the result of our linkages to members of NCERA-101 and the organization's broader objectives. Below are a few members that have adopted Conviron plant growth chambers and/or Argus control system solutions and how they have used them to advance the discovery process.

University of Illinois Urbana-Champaign, CABBI:

- CABBI is the Center for Advanced Bioenergy and Bioproducts Innovation, a U.S. Department of Energy-funded Bioenergy Research Center. CABBI is a collaboration between the University of Illinois Urbana-Champaign and 20 partner institutions.

- The primary challenge researchers faced was the lack of existing facilities that could house tall bioenergy grasses and allow for stable isotope labeling to study plant-microbe interactions.
- To address this gap, CABBI purpose-built high growth height and stable isotope labeling systems integrated with Conviron chambers to study plant growth and interactions with soil microbes under tightly controlled environmental conditions.
- Plexiglass modular enclosures were situated within the growth chambers and can be adjusted in height as the plants grow. The chambers aim to mimic the field environment in regard to light spectrum, intensity, and growth conditions. They also allow precise control over water and nutrient delivery to fully enable the study of bioenergy grasses that are essential for sustainable energy production.
- Reference: https://www.conviron.com/about/clients/stories/cabbi/

Kansas Wheat Innovation Center:

- Kansas Wheat Innovation Center (KWIC) is part of Kansas State University's Grain Science and Industry Complex. The goal of the $15 million, 48,000 sq.ft. facility is to use advanced techniques in wheat research to improve yield and quality of new varieties while shortening the time needed to develop those varieties.
- The challenge is how to get improved varieties into the hands of farmers faster because that is what's necessary to ensure an adequate food supply for current and future generations.
- The Innovation Center's solution is to find desirable traits like disease resistance or drought tolerance in wheat's relatives and cross them to create new, higher quality varieties. Using genetically pure plant lines, or doubled haploids, scientists can then offer a quick route to new gene combinations for higher yields. The process begins in the 15,000 sq.ft. of research laboratories, featuring 13 indoor climate-controlled growth rooms from Conviron.
- After the winter wheat plants have matured in the growth rooms, they get moved to the Argus controlled greenhouses. In total there are eight greenhouses that span nearly 23,000 sq.ft. that provide ideal growing conditions for wheat, even in the hottest summer months.
- Reference: https://www.conviron.com/about/clients/stories/kansas-wheat-innovation-center/

Iowa State University:

- The original plant growth chambers, 30 in total, served researchers well for three decades before technology upgrades became warranted.
- Iowa State University (ISU) endeavored to retrofit their fleet using non-Conviron replacement parts, however it became evident that doing so presented a safety hazard.
- While components could be retrofitted with Conviron OEM parts, when the facility evaluated upgrading several key systems simultaneously such as lights, control systems and refrigeration systems together – brand new chambers become economically attractive and the preferred course of action to position ISU for the future.
- ISU also had an existing Argus control system that they wanted to keep. Primarily because there was no technological or obsolescence reason to replace the central control system but also that

researchers really liked the Argus solution, it's reliability over the years and grew accustomed to using it.

- In total, the project became a multimillion-dollar facility upgrade that involved the installation of several Conviron models:
  - 15 x PGW40
  - 5 x PGR15
  - 6 x PGC Flex
  - 4 x Gen 1000
- Reference: https://www.conviron.com/about/clients/stories/iowa-state-university/

North Carolina State University:

- For several years Conviron has been a financial supporter of the NCSU Controlled Environment Agriculture (CEA) Coalition
- The Controlled Environment Agriculture (CEA) Coalition is a multidisciplinary, controlled environment research group comprised of research scientists, engineers and in close partnership with industry.
- The CEA Coalition aims to develop controlled environment agriculture as an economically and environmentally sustainable option for agricultural practices by performing evidence-based, transformative research.
- Conviron is currently supporting one study to determine the optimal airflow velocity for plant growth in a greenhouse and we are awaiting the results from the research group.
- In addition to pledging our financial support for this important group for another year, Conviron forwarded several research ideas for the coalition's consideration in 2025 including:

1. Using CFD modeling, what does airflow in a plant growth chamber look like (compared to that of a greenhouse) and what is the optimal airflow required to support plant type, architecture, photosynthesis, nutrient uptake and health?
2. What is the difference between a controlled environment grow room vs. a greenhouse? Compare factors related to performance characteristics of each, the impact on the plants and operating costs:
   - Temperature and light uniformity throughout the growing space
   - Controlling fresh air intake, humidity and CO2
   - Airflow velocity
   - Uniformity of plant growth throughout the growing space
   - Yield
   - Growth rates/time to maturity
   - Energy consumption
3. What is the impact of internodal/intra canopy lighting on plant growth and development? Can top lighting be decreased if intra-lighting is used? Can energy consumption be decreased as intra-lighting is closer to the plants and therefore would consume less energy as the PPFD would be lower.

- Reference: https://units.cals.ncsu.edu/cea/industry-partners/